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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/805,811	03/22/2004	Kevin T. Marks	016295.1576	1073

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EXAMINER	
WALTER, CRAIG E	
ART UNIT	**PAPER NUMBER**
2188	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/14/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/805,811	MARKS ET AL.	
	Examiner	Art Unit	
	Craig E. Walter	2188	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 December 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Status of Claims

1. Claims 1-20 are pending in the Application.

Claims 1, 3 and 4 are amended.

Claims 1-20 are rejected.

Response to Amendment

2. Applicant's amendments and arguments filed on 7 December 2006 in response to the office action mailed on 19 April 2006 with respect to claims 5-20 have been fully considered, but they are not persuasive. Therefore, the rejections made in the previous office action are maintained, and restated below, with changes as needed to address the amendments. Applicant's amendments and arguments filed on 7 December 2006 in response to the office action mailed on 19 April 2006 with respect to claims 1-4 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1-4 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites the limitation "the rebuild commands in the cache" in line 7 of the claim. There is insufficient antecedent basis for this limitation in the claim. More specifically, rebuild commands are not previously set forth as being stored in the cache. This limitation introduces ambiguity into the claim, as it is unclear if Applicant intended to recite actually transmitting the commands, or data associated with said commands from the cache. The latter is assumed in view of originally filed claim 1 which unambiguously recites transmitting data in the cache, not commands referencing said data as currently recited in this claim.

Claims 2-4 are rejected for inheriting the deficiencies of claim 1.

Claim Rejections - 35 USC § 102

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 5-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Horst et al. (US Patent 6,567,892 B1), hereinafter Horst.

Since independent claims 5, 10 and 18 have similar limitations as previously presented claim 1, previous Examiner's rejection of claim 1 (hereinafter "previous claim 1") is presented *infra*. This rejection will be additionally referenced as being applicable to the current rejection of claims 5, 10 and 18. The reference to this original rejection will enable current Examiner to maintain previous Examiner's original rejection without the risk of introducing new grounds of rejection.

As for previous claim 1, Horst discloses a method for managing the rebuild commands directed to a drive, the drive having a non-volatile memory and cache (write cache) – column 3, lines 42-43 and column 2, line 27 respectively;

enabling the cache of the drive (write cache is enabled – column 2, lines 28-29);

recording in a first memory location the rebuild commands directed to the drive (record write operations in nonvolatile memory – column 15, lines 10-15); and

periodically causing the drive to flush the cached data associated with the rebuild commands to its non-volatile memory (flush preferably performed whenever host runs out of commands to controller – column 7, lines 55-57);

wherein the each command directed to drive is at least temporarily recorded in the memory location during the period that the cache of the drive is enabled (while cache enabled, data is flushed periodically – column 2, lines 26-37).

Claim 5 rejected with same rationale as previous claim 1. Note, Horst additionally discloses multiple drives and drive controllers, each controller being associated with and coupled to a drive of the array (disk array and an array controller comprises the disk controller – column 5, lines 12-14). Horst also discloses a drive controller with a first memory that stores a history of write commands (record write operations in nonvolatile memory – column 15, lines 10-15).

Claim 10 rejected with same rationale as previous claim 1. Note, Horst additionally discloses writing one or more commands to a journal (record write operations in nonvolatile memory – column 15, lines 10-15). Again, recording write operations in memory, as Horst discloses, is analogous to writing commands to a journal.

Claims 6, 11, 14 and 16 rejected with same rationale as previously presented claim 4 (which incorporates limitations of previous claim 1). Note, Horst additionally discloses transmitting a message indicating that the cached data was written to the media (when flushes are finished controller sends completion interrupts to host – column 7, lines 43-44).

Claims 7, 8 and 13 rejected with same rationale as previously presented claim 3 (which incorporates limitations of previous clam 1).

As for claim 9, Horst discloses the storage array of claim 5, wherein the first memory is non-volatile (nonvolatile memory – column 3, lines 42-43).

Claims 12, 15 and 19 rejected with same rationale as previously presented claim 2 (which incorporates limitations of previous claim 1).

Claims 17 and 20 rejected with same rationale as claim 9.

Claim 18 rejected with same rationale as previously presented claim 3 (which incorporates limitations of previous claim 1).

Note, the rejections of previously presented claims 2-4 are presented below for Applicant's reference:

As for previously presented claim 2, Horst discloses a method for managing the rebuild commands, further comprising the step of disabling the cache of the drive following the successful rebuild of the drive (disabling the cache – column 6, line 53).

As for previously presented claim 3, Horst discloses a method for managing the rebuild commands, wherein the step of causing the drive to flush the cached data to its non-volatile memory comprises the steps of:

maintaining a count of the number of commands stored in the first memory location (read counter – column 8, line 6); and

causing the drive to flush the data to its non-volatile memory when the count of the number of commands stored in the first memory location reaches a predetermined threshold (counter triggers flush when predetermined number M reached – column 8, lines 1-15).

As for previously presented claim 4, Horst discloses a method for managing the rebuild commands, further comprising the step of clearing the first memory location and the count following the successful flushing of data from the cache to the non-volatile memory (binmap is cleared when cache is flushed – column 3, line 7).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Horst (US Patent 6,567,892 B1) in further view of Olson (US PG Publication 2001/0032300 A1).

As for claim 1, Horst teaches a method for managing the rebuild commands directed to a drive, the drive having a first non-volatile memory and a cache (col. 2, lines 38-50 and col. 5, lines 25-53 – each drive comprises a unique first non-volatile memory and a cache):

enabling the cache of the drive (col. 2, lines 26-37 – the cache is enabled);

recording in a second non-volatile memory each rebuild command directed to the drive (col. 15, lines 13-30 – the NOVRAM as depicted in Fig. 1, element 180 stores write commands associated with rebuilding);

periodically causing the drive to flush its cache to cause data in the cache to be transmitted (col. 7, lines 35-57 – the drive flushes the cache);

wherein the each rebuild command directed to drive is at least temporarily recorded in the second non-volatile memory during the period that the cache of the drive is enabled. (col. 15, lines 13-30 – the NOVRAM stores the commands while the cache is caching the drive's data).

Horst however fails to teach flushing the cache to cause the data to be transmitted specifically to the non-volatile memory as recited in this claim.

Olson however teaches a method and apparatus for storing transactional information in persistent memory wherein data stored in the cache of a persistent memory (i.e. disk) is periodically flushed to a non-volatile memory (paragraph 0012, all lines and claim 20).

It would have been obvious to one of ordinary skill in the art at the time of the invention for Horst to further include Olson's method and apparatus for storing transactional information in persistent memory into his own disk array system. By doing so, Horst could benefit from having a more efficient means of recovering transactional information after the occurrence of a system failure as taught by Olson in paragraphs 0006 through 0007, all lines.

As for claim 2, Horst discloses the method for managing the rebuild commands directed to a drive of claim 1, further comprising the step of disabling the cache of the drive following the successful rebuild of the drive (column 6, line 53 – the cache may be disabled since the rebuild is complete).

As for claim 3, Horst discloses the method for managing the rebuild commands directed to a drive of claim 2, wherein the step of causing the drive to flush the cached data comprises the steps of:

maintaining a count of the number of commands stored in the first memory location (column 8, line 6 – the read counter counts commands); and

causing the drive to flush the data to its non-volatile memory when the count of the number of commands stored in the first memory location reaches a

predetermined threshold (the counter triggers flush when predetermined number M reached – column 8, lines 1-15).

Horst however fails to teach flushing the cache to cause the data to be transmitted specifically to the non-volatile memory as recited in this claim.

Olson teaches a method and apparatus for storing transactional information in persistent memory wherein data stored in the cache of a persistent memory (i.e. disk) is periodically flushed to a non-volatile memory (paragraph 0012, all lines and claim 20).

As for claim 4, Horst discloses the method for managing the rebuild commands directed to a drive of claim 3, further comprising the step of clearing the first memory location and the count following the successful flushing of data from the cache to the non-volatile memory (binmap is cleared when cache is flushed – column 3, line 7).

Horst however fails to teach flushing the cache to cause the data to be transmitted specifically to the non-volatile memory as recited in this claim.

Olson however teaches a method and apparatus for storing transactional information in persistent memory wherein data stored in the cache of a persistent memory (i.e. disk) is periodically flushed to a non-volatile memory (paragraph 0012, all lines and claim 20).

It would have been obvious to one of ordinary skill in the art at the time of the invention for Horst to further include Olson's method and apparatus for storing transactional information in persistent memory into his own disk array system. By doing so, Horst could benefit from having a more efficient means of recovering transactional

information after the occurrence of a system failure as taught by Olson in paragraphs 0006 through 0007, all lines.

Response to Arguments

6. Applicant's arguments with respect to claims 1-4 have been considered but are moot in view of the new ground(s) of rejection.

7. Applicant's arguments with respect to claims 5-20 have been considered but they are not persuasive.

As for claim 5, Applicant contends that Examiner pointed to column 15, lines 10-15 of Horst as disclosing "a drive controller with a first memory that stores a history of write commands", and further asserts, "[t]he cited portion of Horst does not discuss drive controllers. Thus, the cited portion of Horst does not disclose "wherein each drive controller comprises a first memory, wherein the first memory is operable to store a history of write commands transmitted from each drive controller to its associated drive"".

This argument is not persuasive as it is clear from the previous Office action that Examiner cited col. 5 to address the disk controllers, not col. 15 as incorrectly interpreted by Applicant. Applicant should note the description of the disk array controller (which comprises the disk controllers) in column 5, and is directed to Fig. 1 of Horst for further illustration. For example, each drive (i.e. element 110) is associated with a unique disk controller (i.e. element 122). Each controller comprises at least a first memory (including elements 126, 128 and 180) **operable** to store write commands.

Applicant additionally asserts, "Horst does not disclose collecting rebuild commands in a journal pending the flushing of a cache during a rebuild process", however this argument is not persuasive, as this recitation is not commensurate in scope with the claim limitation. Claim 5 does not require "collecting rebuild commands in a journal pending the flushing of a cache during a rebuild process" as alleged by Applicant. The claim does require, *inter alia*, "recording each write command sent to the drive in the first memory", however this limitation was addressed in the previous rejection of claim 1.

As for claim 10, Applicant contends "Examiner failed to address various elements of claim 10 independently, including the limitation "forcing the drive to flush the data in the write cache to the storage media"". This argument is not persuasive as it is clear from the previous Office action that Examiner addressed this limitation by referencing the previous rejection of claim 1 (i.e. col. 7, lines 55-57 of Horst and the flow diagram illustrated in Fig. 2).

Applicant additionally asserts, "Horst does not disclose collecting rebuild commands in a journal pending the flushing of a cache during a rebuild process", however this argument is not persuasive, as this recitation is not commensurate in scope with the claim limitation. Claim 10 does not require "collecting rebuild commands in a journal pending the flushing of a cache during a rebuild process" as alleged by Applicant. The claim does require, *inter alia*, "writing one or more commands to a journal", however this limitation was addressed in the previous rejection of claim 10.

As for claim 18, Applicant asserts that "Horst does not disclose collecting rebuild commands in a journal pending the flushing of a cache during a rebuild process" for the same reasons as stated in claim 1. This argument is not persuasive, as this recitation is not commensurate in scope with the claim limitation. Claim 18 requires, *inter alia*, "recording commands transmitted from the drive controller to the drive during the period that the drive is being rebuilt". This limitation does not necessarily require "collecting rebuild commands in a journal pending the flushing of a cache during a rebuild process" as alleged by Applicant. Examiner maintains that Horst does in fact anticipate this claim for the same reasons as discussed in the previous rejection of claim 3 (incorporating the limitations of claims 1 and 2).

As for claims 6-9, 11-17, 19 and 20, Applicant's assertion that these claims are allowable for at least depending upon each of their respective base claims is rendered moot, as Examiner maintains that each base claim is either anticipated or rendered obvious in view of Horst per the rejections and arguments discussed *supra*.

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

9. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Craig E. Walter whose telephone number is (571) 272-8154. The examiner can normally be reached on 8:30a - 5:00p M-F.

11. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hyung S. Sough can be reached on (571) 272-6799. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

12. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Craig E Walter
Examiner
Art Unit 2188

CEW

HYUNG SOUGH
SUPERVISORY PATENT EXAMINER
2-12-07